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(54) **SYSTEM FOR APPLICATION  
PERSONALIZATION FOR A MOBILE  
DEVICE**

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7,200,383 B2	4/2007	Eronen	
7,224,987 B1	5/2007	Bhela et al.	
7,243,105 B2 *	7/2007	Thint	G06F 17/30867
7,266,395 B2	9/2007	Schnurr	
7,289,793 B2	10/2007	Norwood et al.	
7,640,008 B2	12/2009	Gallagher et al.	
7,653,392 B2	1/2010	Ovadia et al.	
7,734,680 B1 *	6/2010	Kurapati	G06F 17/30035 709/203
7,813,822 B1 *	10/2010	Hoffberg	G06K 9/00369 381/73.1
7,831,529 B2	11/2010	Horvitz et al.	
7,865,841 B2	1/2011	Morikawa	

(Continued)

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#### FOREIGN PATENT DOCUMENTS

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EP	1971118 A1	9/2008
EP	1978454 A1	10/2008

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**G06F 9/44** (2006.01)

Nilton Bila, "Mobile user Profile Acquisition Through Network  
Observables and Explicit User Queries", 2008. <http://ect.bell-labs.com/who/tkh/publications/papers/inamdm.pdf>.

(Continued)

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(56) **References Cited**

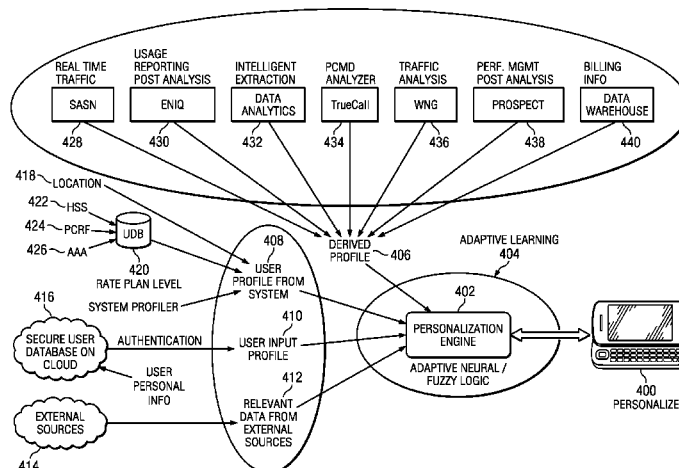
#### U.S. PATENT DOCUMENTS

5,867,799 A *	2/1999	Lang	G06F 17/30702
5,943,619 A	8/1999	Coyne et al.	
6,199,067 B1 *	3/2001	Geller	G06F 17/30702
RE38,267 E	10/2003	Borkowski et al.	
6,871,186 B1	3/2005	Tuzhilin et al.	
6,985,723 B2	1/2006	Kil	
7,069,026 B2	6/2006	McClure	
7,181,500 B2 *	2/2007	Jen	H04L 29/06 707/999.003

(57) **ABSTRACT**

A system for controlling applications of a wireless mobile device includes a server for receiving data related to an adaptive user profile and for controlling operations of applications within the wireless mobile device. An adaptive neural/fuzzy logic control application implemented within the network server generates the adaptive user profile responsive to the received data. The adaptive user profile controls operations of the applications within the wireless mobile device and changes in real time responsive to the received data.

**20 Claims, 4 Drawing Sheets**



(56)

## References Cited

## U.S. PATENT DOCUMENTS

7,974,714 B2 \* 7/2011 Hoffberg ..... G06K 9/00369  
360/75

8,280,957 B2 \* 10/2012 Wu ..... H04M 3/42365  
709/204

2002/0160745 A1 10/2002 Wang  
2003/0060896 A9 \* 3/2003 Hulai ..... G06F 9/4443  
700/1

2003/0065670 A1 4/2003 Bisson et al.  
2003/0098892 A1 \* 5/2003 Hiipakka ..... G06F 3/0481  
715/846

2003/0110503 A1 6/2003 Perkes  
2004/0128301 A1 7/2004 Thint et al.  
2004/0260565 A1 \* 12/2004 Zimniewicz ..... G06Q 30/02  
713/1

2004/0267941 A1 \* 12/2004 Hodges ..... G06Q 30/02  
709/228

2005/0153691 A1 7/2005 Xue et al.  
2006/0079224 A1 4/2006 Welnick et al.  
2006/0143646 A1 \* 6/2006 Wu ..... H04M 3/42365  
725/10

2006/0167977 A1 \* 7/2006 Wu ..... H04L 29/06  
709/203

2006/0291481 A1 \* 12/2006 Kumar ..... H04L 29/06027  
370/400

2007/0016476 A1 \* 1/2007 Hoffberg ..... G05B 15/02  
705/14.64

2007/0043731 A1 \* 2/2007 Wu ..... H04L 29/12009  
2007/0087756 A1 \* 4/2007 Hoffberg ..... G06Q 10/0631  
455/450

2007/0097959 A1 \* 5/2007 Taylor ..... G06F 21/10  
370/352

2007/0139372 A1 \* 6/2007 Swanburg ..... G06F 3/0481  
345/156

2007/0266439 A1 \* 11/2007 Kraft ..... H04L 63/083  
726/26

2007/0299796 A1 \* 12/2007 Macbeth ..... G06Q 10/10  
706/16

2008/0065574 A1 \* 3/2008 Hu ..... G06N 3/08  
706/20

2008/0189360 A1 8/2008 Kiley et al.  
2008/0214157 A1 9/2008 Ramer et al.  
2008/0215709 A1 \* 9/2008 Kemp ..... H04L 67/40  
709/219

2008/0227440 A1 9/2008 Settepalli  
2008/0268830 A1 10/2008 Sharma et al.  
2008/0293375 A1 \* 11/2008 Swanburg ..... H04M 11/002  
455/405

2008/0313230 A1 12/2008 Karaoguz et al.  
2009/0061837 A1 \* 3/2009 Chaudhri ..... G06F 3/0481  
455/418

2009/0132441 A1 \* 5/2009 Muller ..... H04N 7/163  
706/11

2009/0138338 A1 \* 5/2009 Moukas ..... G06Q 10/0631  
705/7.29

2009/0150514 A1 6/2009 Davis et al.  
2009/0197616 A1 \* 8/2009 Lewis ..... G06Q 30/02  
455/456.1

2009/0234784 A1 9/2009 Buriano et al.  
2009/0248694 A1 10/2009 Martinez et al.  
2009/0254572 A1 \* 10/2009 Redlich ..... G06Q 10/06  
2009/0281887 A1 11/2009 Deakin et al.  
2009/0281975 A1 \* 11/2009 Atallah ..... G06N 3/02  
706/18

2009/0281997 A1 11/2009 Jain  
2010/0011299 A1 \* 1/2010 Brodersen ..... H04L 67/36  
715/740

2010/0042647 A1 \* 2/2010 Schultz ..... H04L 12/1831  
379/85

2010/0138370 A1 6/2010 Wu et al.  
2010/0150102 A1 6/2010 Li et al.  
2010/0162342 A1 \* 6/2010 Piepenbrink ..... H04N 7/17318  
725/132

2010/0173628 A1 7/2010 Hosain et al.  
2010/0198939 A1 \* 8/2010 Raleigh ..... H04L 41/0806  
709/217

2010/0257015 A1 \* 10/2010 Molander ..... G06Q 10/1097  
705/7.21

2010/0278119 A1 11/2010 Potkonjak  
2010/0317420 A1 \* 12/2010 Hoffberg ..... G06Q 30/0207  
463/1

2010/0332431 A1 12/2010 Ribiere et al.  
2011/0022312 A1 1/2011 McDonough et al.  
2011/0028138 A1 \* 2/2011 Davies-Moore .... G06F 3/04817  
455/418

2011/0034242 A1 \* 2/2011 Aronzon ..... A63F 13/10  
463/29

2011/0083069 A1 \* 4/2011 Paul ..... G06F 8/60  
715/234

2012/0221955 A1 \* 8/2012 Raleigh ..... H04M 15/00  
715/736

2012/0233103 A1 \* 9/2012 Ashrafi ..... G06N 3/0436  
706/16

2014/0180983 A1 \* 6/2014 Deng ..... G06N 3/02  
706/15

## FOREIGN PATENT DOCUMENTS

EP 2003550 A1 12/2008  
GB 2271486 A 4/1994  
WO 9511578 A1 4/1995  
WO 9808314 A1 2/1998  
WO 02086738 A1 10/2002  
WO 2005039115 A1 4/2005  
WO 2008125729 A1 10/2008  
WO 2010127137 A1 11/2010

## OTHER PUBLICATIONS

Xuemin Shen, "User mobility profile prediction: An adaptive fuzzy interference approach", 2000. [http://www2.cs.science.cmu.ac.th/mssc/alumni/2548/documents/fuzzy\\_paper/12\\_p363-shen.pdf](http://www2.cs.science.cmu.ac.th/mssc/alumni/2548/documents/fuzzy_paper/12_p363-shen.pdf).

Richard Hull, Have it your way: Personalization of Network-Hosted Services, 2002. <http://oz.stern.nyu.edu/seminar/fa02/0207paper.pdf>.

M. Lankhorst, H. Van Kranenburg, A. Salden, and A. Peddemors. 2002. Enabling Technology for Personalizing Mobile Services. In Proceedings of the 35th Annual Hawaii International Conference on System Sciences (HICSS'02)—vol. 3—vol. 3 (HICSS'02), vol. 3. IEEE Computer Society, Washington, DC, USA, 87.2-. <http://www.lab.novay.nl/~arjan/pub/hicss02-lankhorst.pdf>.

Robbie Schaefer "Fuzzy Evaluation of User Profiles" Paderborn University/C-LAB, Fuerstenallee 11, Paderborn, Germany <http://websrv2.c-lab.de/ubisec/publications/CHIWS04.pdf>.

Stephen Lawson, "'Cisco Cultural Advisor' might help workers collaborate," Computer World.com, Nov. 19, 2010; 03:25 PM ET; [http://www.computerworld.com/s/article/9197439/\\_Cisco\\_Cult...](http://www.computerworld.com/s/article/9197439/_Cisco_Cult...)

K. Daniel, T. Tran, and C. Wietfeld, "IP-Based Overlay Signaling for Seamless Service Roaming in Heterogeneous Networks," Abstract; IEEE Xplore Digital Library, May 12, 2009.

S. Mohanty, "A new architecture for 3G and WLAN integration and inter-system handover management," Abstract; Published in: Wireless Networks, vol. 12, Issue 6 (Nov. 2006), pp. 733-745; ACM Portal, The Guide to Computing Literature.

J. O'Donovan and B. Smyth, "Trust in Recommender Systems," IUI'05, Jan. 9-12, 2005, San Diego, California, USA; pp. 167-174.

Quintero, A., "A user pattern learning strategy for managing users' mobility in UMTS networks," Abstract; IEEE Xplore Digital Library, Oct. 10, 2005.

R. Gellens, "Wireless Device Configuration (OTASP/OTAPA) via ACAP," The Internet Society; Jul. 1999.

N. Shenoy, "A framework for seamless roaming across heterogeneous next generation wireless networks," Published in: Wireless Networks, vol. 11, Issue 5, (Sep. 2005); retrieved from The ACM Guide to Computing Literature Digital Library.

M. Lankhorst, H. Van Kranenburg, A. Salden, and A. Peddemors. 2002. Enabling Technology for Personalizing Mobile Services. In Proceedings of the 35th Annual Hawaii International Conference on System Sciences (HICSS'02)—vol. 3—vol. 3 (HICSS '02), vol. 3. IEEE Computer Society, Washington, DC, USA, 87.2-. <http://www.lab.novay.nl/~arjan/pub/hicss02-lankhorst.pdf>.

(56)

**References Cited**

**OTHER PUBLICATIONS**

Jani Mantyjarvi, "Adapting applications in handheld devices using fuzzy context information", 2003. <http://people.sinclair.edu/kenbaker/Ken/handheld%20using%20fuzzy%20context-Seppanen.pdf>.  
Miika Valtonen, Antti-Matti Vainio, and Jukka Vanhala. 2009. Proactive and adaptive fuzzy profile control for mobile phones. In Proceed-

ings of the 2009 IEEE International Conference on Pervasive Computing and Communications (PERCOM '09). IEEE Computer Society, Washington, DC, USA, 1-3. DOI=10.1109/PERCOM.2009.4912801 <http://dx.doi.org/10.1109/PERCOM.2009.4912801> <http://www.students.tut.fi/~valtone8/Proactive%20and%20Adaptive%20Fuzzy%20Profile%20Control.pdf>.

\* cited by examiner

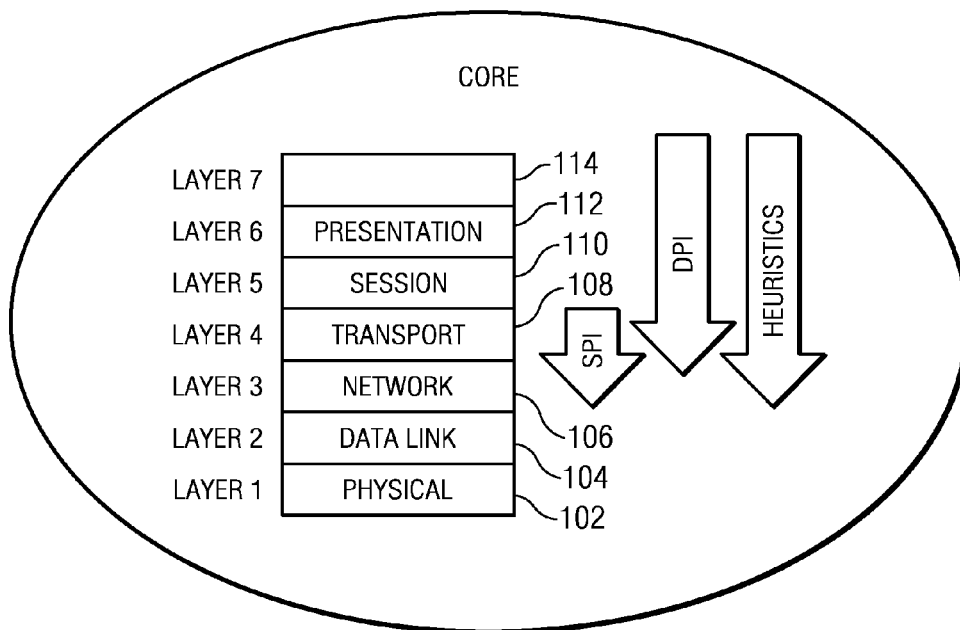


FIG. 1

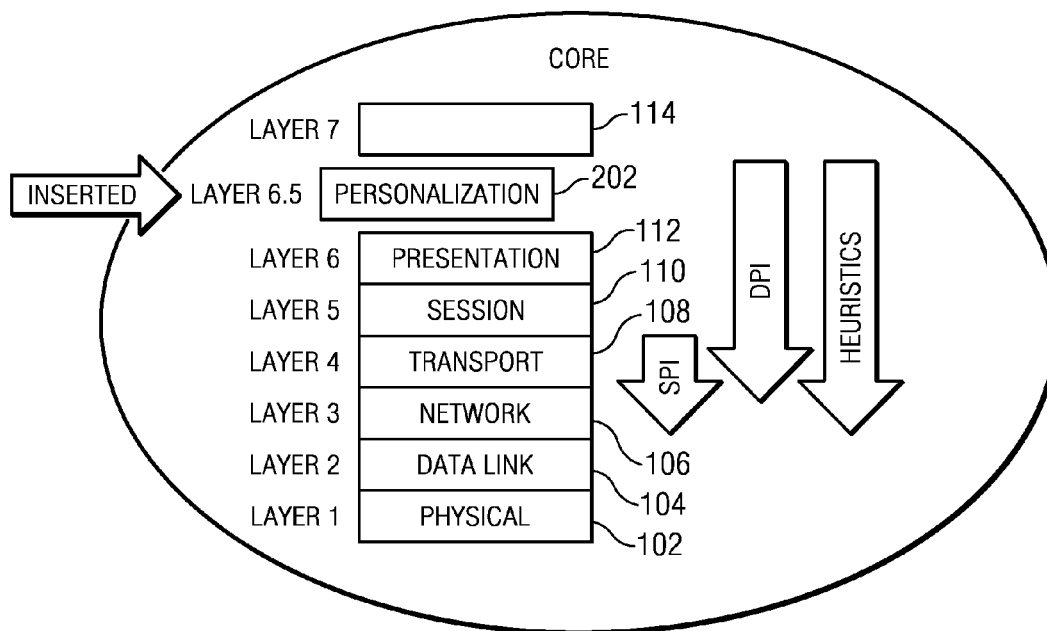


FIG. 2

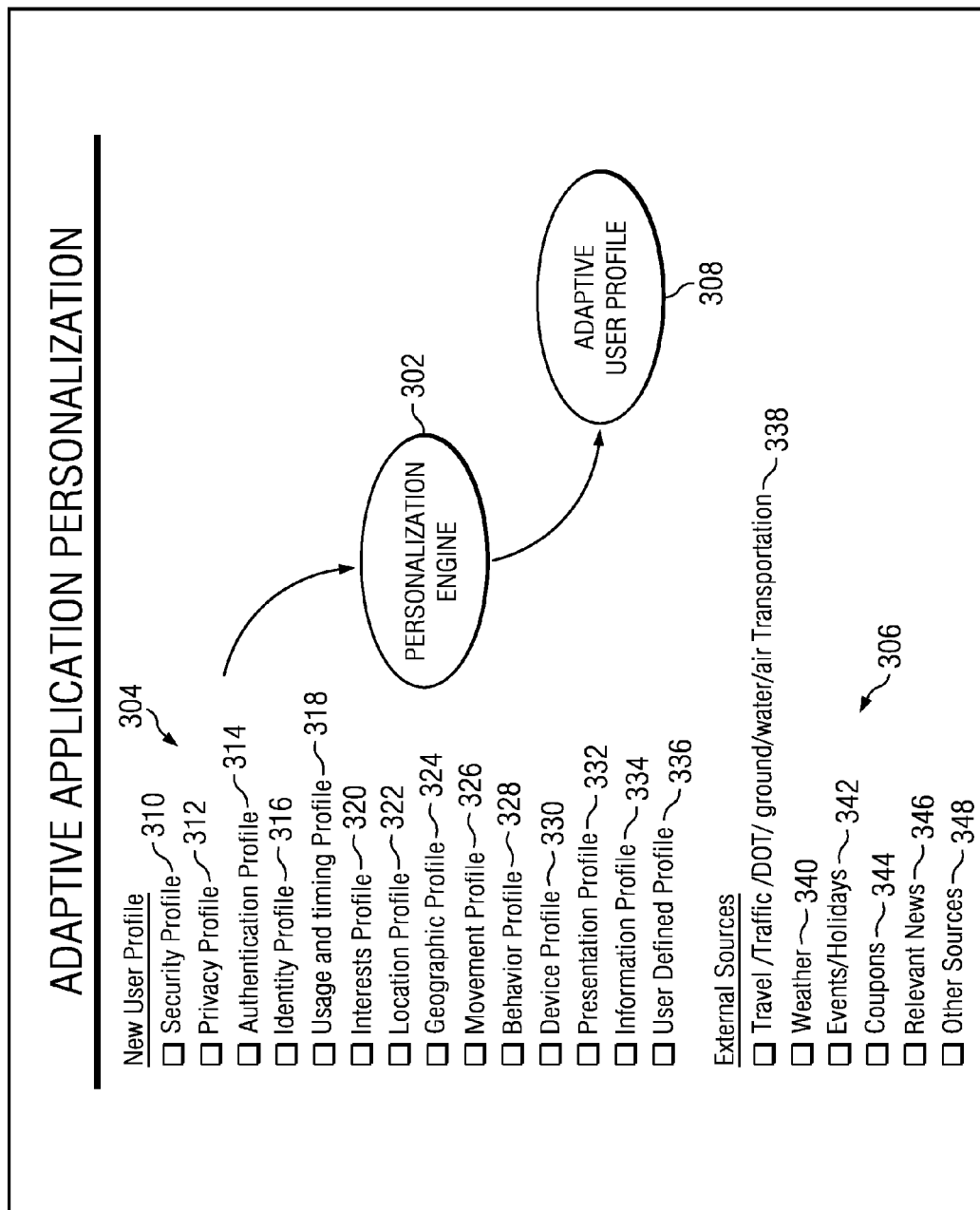
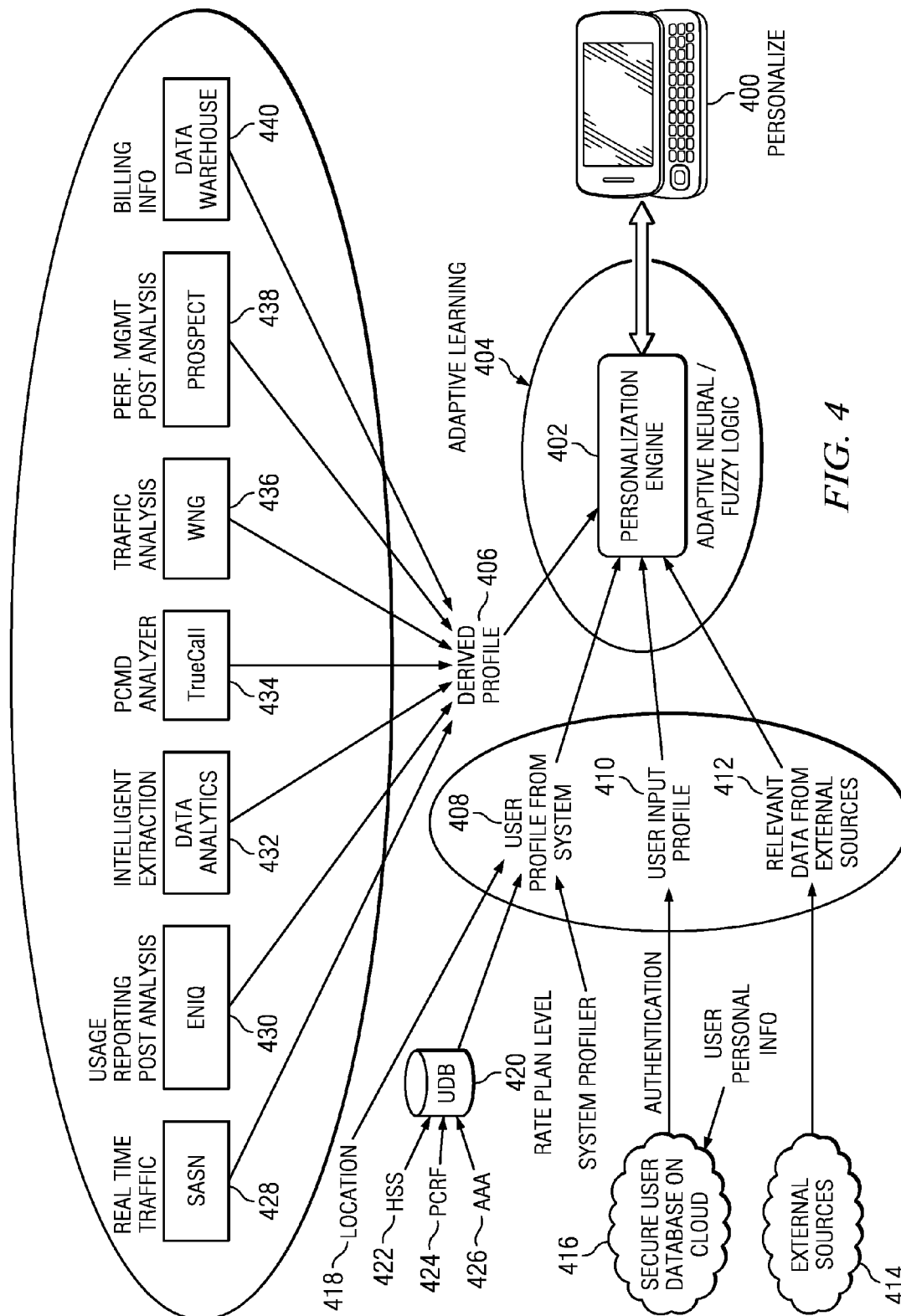


FIG. 3



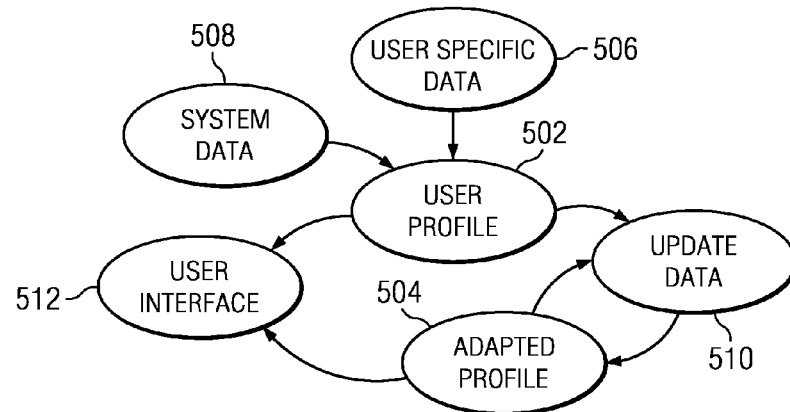


FIG. 5

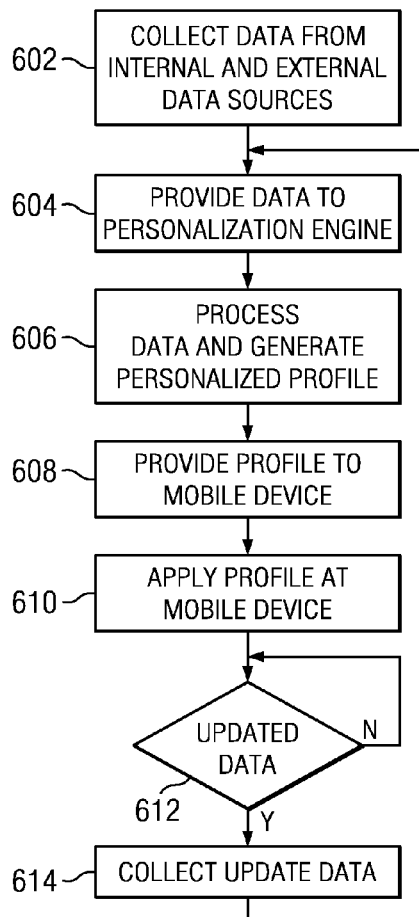


FIG. 6

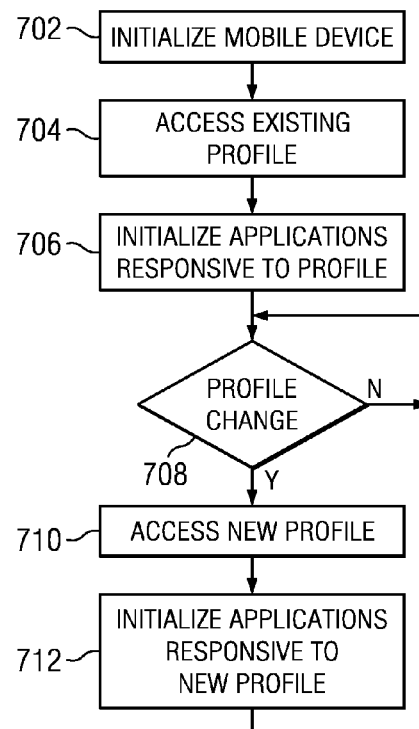


FIG. 7

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# SYSTEM FOR APPLICATION PERSONALIZATION FOR A MOBILE DEVICE

## TECHNICAL FIELD

The present invention relates to the operation of applications upon a mobile device, and more particularly, to a system and method for creating an adaptive personal profile for controlling presentation of applications upon a wireless mobile device.

## BACKGROUND

As wireless device applications and wireless networks such as the 4G network continue to develop, a huge spectrum of applications are becoming available for end users to choose from. These applications provide the end users a wide variety of processes, abilities and solutions that may be sent to the user. This variety of applications are only useful to the end user when the applications are accessed and enabled to provide the end user with specific types of information they may require. Thus, some means for controlling the manner in which the information provided by the various applications could be presented to an end user would be of great interest and benefit to the end user. More particularly, the ability for a service provider to provide a service in which the manner the applications present information to an end user could be controlled in a manner beneficial to that user would provide a potential marketing benefit and revenue stream to the service provider. The service provider could provide this as a specialized service to the end user.

## SUMMARY

The present invention, as disclosed and described herein, in one aspect thereof, comprises a system for controlling applications of a wireless mobile device. A network server receives data related to an adaptive user profile and controls operations of applications within the wireless mobile device. An adaptive neural net/fuzzy logic control application implemented within the network server generates the adaptive user profile responsive to the received data. The adaptive user profile controls the operation of the applications within the wireless mobile device and changes in real time responsive to changes in user behavior and profile.

## BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding, reference is now made to the following description taken in conjunction with the accompanying Drawings in which:

FIG. 1 illustrates the various control layers provided within a wireless network;

FIG. 2 illustrates the additional personalization layer that may be inserted within the wireless protocol layer stack;

FIG. 3 illustrates the manner in which various user profile information and external information may be combined within a personalization engine to provide an adaptive personalized user interface;

FIG. 4 illustrates the manner in which the personalization engine may combine a variety of data to present a personalized user profile within a wireless mobile device;

FIG. 5 illustrates the manner in which the user profiles are created, updated and used to control a user interface;

FIG. 6 is a flow diagram describing the operation of the system of FIG. 4; and

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FIG. 7 is a flow diagram describing the manner in which applications within a wireless device are controlled using the adaptive user profile.

## DETAILED DESCRIPTION

Referring now to the drawings, wherein like reference numbers are used herein to designate like elements throughout, the various views and embodiments of a system for application personalization for a mobile device are illustrated and described, and other possible embodiments are described. The figures are not necessarily drawn to scale, and in some instances the drawings have been exaggerated and/or simplified in places for illustrative purposes only. One of ordinary skill in the art will appreciate the many possible applications and variations based on the following examples of possible embodiments.

Referring now to the drawings, and more particularly to FIG. 1, there is illustrated a drawing of the various control layers that are associated with providing a wireless connection to a portable wireless device. These include the physical layer 102, data link layer 104, network layer 106, the transport layer 108, the session layer 110, the presentation layer 112 and the application layer 114. Each of these seven layers together represents the open systems interconnection model (OSI model) for wireless networks. The OSI model is a manner for subdividing a communication system into the described seven layers. Each layer comprises a collection of conceptually similar functions that provide service to the layer above it and receives services from the layer below it. Within each layer, an instance provides services to the instances at the layer above and requests services from the layers below.

The physical layer 102 defines the electrical and physical specifications for devices providing the wireless communications. It defines the relationship between a device and its transmission medium. The physical layer 102 provides the media signal and binary transmission requirements for the wireless communication system. The physical layer 102 provides for the establishment and termination of a connection to a communications medium, provides for the participation in the process whereby communications resources are effectively shared amongst multiple users. The physical layer 102 also provides for modulation or conversion between the representation of digital data and user equipment and corresponding signals transmitted over a communications channel.

The data link layer 104 provides the functional and procedural means to transfer data between network entities and to detect and correct errors that may occur within the physical layer 102. Thus, the data link layer 104 enables for communications between various devices of the communications network. The data link layer 104 provides for point-to-point and point-to-multi-point communications in the wireless network. The data link layer 104 combines the bit data received from the physical layer 102 into frames for transmission to the network layer 106.

The network layer 106 enables for path determination and logical addressing within the wireless network. The network layer 106 provides the functional and procedural means of transferring variable length data sequences from a source to a destination via the wireless network while maintaining the quality of service requested by the transport layer 108. The network layer 106 performs network routing functions and may also perform fragmentation and reassembly of data packets that are generated from frames received from the data link layer 104. The network layer 106 also reports delivery



errors between network components. Routers operate within the network layer **106** enabling the transmission of data between nodes of the wireless network.

The transport layer **108** provides transparent transfer of data between end users and provides reliable data transfer services to the higher data layers. The transport layer **108** controls the reliability of a given communications link through flow control, segmentation/de-segmentation and error control. Some protocols are state and connection oriented. The transport layer **108** can track segments transmitted over a communication link and re-transmit those that fail. The transport layer **108** also provides acknowledgments of successful data transmissions and sends a next group of data if no errors have occurred.

The session layer **110** controls the connections between various computers and nodes of the wireless communication network. The session layer **110** establishes, manages and terminates the connections between local and remote applications. The session layer **110** provides full duplex, half duplex or simplex operations and establishes check pointing, adjournment, termination and restart procedures for the network. The session layer **110** is responsible for closing communication sessions and for session check pointing and recovery.

The presentation layer **112** establishes context between application layer **114** entities in which the higher layer entities may use different syntax and semantics if the presentation service provides a mapping between them. If mapping is available, presentation service data units are encapsulated into session protocol data units and passed down the stack. The presentation layer **112** provides independence from data representation (e.g., encryption) by translating between applications within the application layer and network formats. The presentation layer **112** transforms data into a form that applications within the application layer will accept. The presentation layer formats and encrypts data to be sent across the network.

The application layer **114** is the layer closest to the end user which means that the application layer and the user interact directly with a software application. The application layer **114** interacts with software applications that implement a communicating component. Such application programs fall outside the scope of the OSI model. Application layer functions typically include identifying communication partners, determining resource availability and synchronizing communications. When identifying communication partners, the application layer **114** determines the identity and availability of communication partners for applications with data to transmit. When determining resource availability, the application layer **114** decides whether sufficient network resources for the requested communication exist. In synchronizing communications, all communications between applications requires cooperation that is managed by the application layer **114**. The application layer **114** is used for controlling the information, which is presented to the user such as applications like their user interface. By providing some manner for controlling the information presented from the application layer **114** to the various applications of the control of the application layer **114**, a user can be provided with a more valuable content experience, and if the system provider can control the manner in which the applications are being presented to the user, they are providing their customers with a benefit that can create revenue generating capabilities for the system provider.

Referring now to FIG. 2, there is illustrated an implementation of the current invention wherein a personalization layer **202** is inserted between the application layer **114** and the

presentation layer **112**. The personalization layer **202** will extract data from the number of different sources as described hereinbelow to enable the creation of an adaptive user profile. The adaptive user profile enables control of applications within the application layer **114** in a way that is unique to each user. A personalization layer **202** will allow the presentation of information to a user that is unique and of interest to the user without any interaction or input by the user. The personalization layer **202** obtains and compiles all of the information as more fully described hereinbelow to enable the generation of the adaptive user profile and utilizes the adaptive user profile to control the initiation and presentation of the applications within the application layer **114** to present user specific information that is most likely to be of interest and use to the user of a wireless mobile device.

Referring now to FIG. 3, there is illustrated a manner in which a personalization engine **302** may utilize a number of user profiles **304** and external sources **306** to generate the adaptive user profile that is personalized to a particular user. A security profile **310** defines the security information that is associated with a particular user profile **308**. This can include information such as passwords, user IDs and other types of security information that allows an individual to log onto and access various types of online information. A privacy profile **312** provides information that should not be disclosed with respect to the user profile **308**. The privacy profile **312** identifies certain types of information that a user desires to maintain in private and not to be shared with third party individuals. The authentication profile **314** contains user passwords and IDs that are necessary for authenticating the user profile within various applications within the application layer **114**.

An identity profile **316** contains identification information with respect to a particular user and user profile. This could contain information such as the user's name, age, birth date and any other type of information that is necessary for confirming or providing an identity of a user or information with respect to the user's identity. The usage and timing profile **318** stores and provides information with respect to amounts and time of usage by a user of particular applications or other types of services with respect to their mobile device. The usage and timing profile **318** stores in a central location all of the time-based usage information and times that these usages occurred so that they may be accessed by the personalization engine for generation of the adaptive user profile **308**.

The interest profile **320** stores information relating to the interest of a user. The interest profile includes user-entered information such as interest in particular activity, hobby, television shows, movies, types of music, etc. The interest profile **320** additionally includes information that is data mined from user choices made with respect to their mobile wireless device such as visited websites, music or information downloaded to the handset or numbers contacted through the mobile device.

A location profile **322** stores information with respect to the present and past actual locations of the mobile device such as a specific restaurant, movie theater, bookstore, shop, etc. The geographic profile **324** provides information with respect to the geographic position of the mobile device with information such as the city, state country in which you are located and the positions that the mobile device travels to within the city. The movement profile **326** provides information with respect to movements of the mobile device at particular points in time. The movement information can be indexed and associated with particular times of the day, week, month, year, etc., in order to allow future determinations of possible movement characteristics to be made from past movement profiles.

The behavior profile **328** includes information with respect to particular behaviors of the user associated with the adaptive user profile **308**. This behavior profile information can include details with respect to a users actions with respect to use of the voice and data features of the mobile device, such as downloading 5 minutes of video only to watch the first 10 seconds, click patterns when accessing the web, etc. The device profile **330** contains information describing the characteristics and parameters of the mobile device in which the adaptive user profile **308** is implemented and with respect to the various applications that are installed and utilized within the mobile device. The presentation profile **332** provides information with respect to the manner a user likes to view information on the mobile device, such as using high definition HD, resolution if User Equipment (UE) supports this format. The information profile **334** includes information in which the user has an interest. Finally, the user-defined profile **336**, which is stored on a secure cloud, enables the user to enter various types of information that are specific to a user's desires, wants and needs that will affect the operation of the personalization engine **302** and the generation of the adaptive user profile.

The external sources **306** comprise various sources that are accessed via the Internet that provide information that is useful in the personalization engine **302** generating the adaptive user profile **308** for controlling the applications within a mobile device. External sources **306** include information such as travel information, traffic information, and ground/water/air transportation information **338** that may be accessed over the Internet. This type of travel information can be useful in determining positioning movement or travel decisions with respect to the mobile device by providing up-to-date current travel/traffic/transportation information to the mobile device. Weather information **340** may be used to provide current weather information to the mobile device. Event/holiday information **342** can be in the form of a calendar type functionality that enables determination of particular unique events, such as birthdays, anniversaries, etc., the occurrence of major holidays, such as Thanksgiving, Christmas, New Years, etc or generic events (i.e. Valentines Day, St. Patrick's Day, etc.).

Coupon information **344** stores information with respect to coupons of retailers or sellers with which a particular user may have some type of predefined relationship. In the appropriate situation new coupon information **344** may be retrieved and presented through the adaptive user profile **308** on a mobile device such that a user may take advantage of various coupons that may be available to them of which they were not aware. Relevant news information **346** can be presented from various news websites such as Fox News, MSNBC, CNN, Yahoo!, Google, etc., that provides news information to a user based upon that user's particular interest. Thus, for example, if a user was particularly interested in the stock market, various stock increases or decreases could be obtained from these websites and provided to the user automatically. Finally, various other types of information sources **348** may be utilized based upon the type of information that is needed to implement particular information to a user through the applications of the mobile device as required by the operation of the adaptive user profile **308**.

Referring now to FIG. 4, there is provided a more detailed implementation of the personalization engine **402** and the manner in which it generates the adaptive user profile for use within a wireless mobile device **400**. The personalization engine **402** utilizes an adaptive neural net/fuzzy logic network **404**. The adaptive neural net/fuzzy logic network **404** obtains information from a number of different sources

including derived profiles **406**, user profiles from the wireless network system **408**, user input profiles **410** and external data sources **412**. The derived profiles **406** come from a number of different sources as will be described further hereinbelow that mine particular types of data from existing sources in order to generate the derived profile **406** information. The user profiles **408** comprise information that is obtained from the system that is providing the wireless network services to the wireless mobile device **406**. User input profiles **410** comprise information that the user has created to assist the personalization engine **402** in generating the adaptive user profiles for controlling their wireless mobile device **400**. The relevant data from external data sources **412** comprise various types of information that may be necessary for the personalization engine **402** to generate the adaptive user profile such as traffic sources, weather information, etc., as described previously with respect to FIG. 3.

The external data sources **412** obtain the relevant data from various external sources **414** that provide information to the personalization engine **402** such as traffic information, weather information, news, coupons, or events and holidays as discussed hereinabove. The external sources **414** are accessed and provide information, as necessary, depending upon particular applications that are being actuated by the user profile generated by the personalization engine **402**.

The user input profiles **410** are provided from a secure user database **416** on a user secure cloud network. The secure user database **416** is accessed through the user cloud by the user in a private fashion that allows the user to enter any information they desire to affect the generation of their adaptive user profile by the personalization engine **402**. Before accessing the secure user database, the user input profile **410** must provide some type of authentication process between the user input profile and the secure user database **416** in order to access the secure user database by authorized users and limit unwanted usage of the information within the secure user database.

User profiles **408** from the system come from the wireless system provider for use by the personalization engine **402**. This type of system user profile **408** may include location information **418** or information that is provided from the UDB (unified database) **420** that collects information from the home subscriber server (HSS) **422**, policy charging and rules function (PCRF) **424** and the AAA (Authentication, Authorization and Accounting) **426**. The user database **420** stores user system information from each of the described sources. The HSS **422** is a master user database that supports network components that are handling wireless calls. The HSS **422** contains subscription related information (subscriber profiles) that includes information relating to users making or receiving calls and their subscription levels. The HSS **422** additionally performs authentication and authorization of users for the network and can provide information relating to a subscriber's location and IP information. The PCRF **424** determines the policy rules associated with a multimedia network. The PCRF **424** plays a central role in next generation networks. The PCRF **424** assesses subscriber databases and other specialized functions such as charging systems and provides this information to the user database **420**. The PCRF **424** obtains and provides quality of service and traffic policy information to the user database **420**.

The AAA **426** comprises the traditional Authentication, Authorization and Accounting. The AAA **426** is responsible for authentication and authorizing access to the wireless network. The AAA **426** also performs accounting functions with respect to the usage of the mobile device on the wireless network.

The derived profile **406** comprises information that is derived from various sources such that different types of information that are useful for the personalization engine **402** to create the adaptive user profile may be used. Various examples of these types of nodes or functions for determining information for the derived profile are illustrated in FIG. 4. However, other types of functions or nodes may also be utilized to create derived profile **406** information. The SASN (service aware support node) **428** is used for generating real time traffic information for storage in the derived profile **406**. The service aware support node **428** is a tool for traffic inspection in multi-vendor multi-accessed networks. SASNs **428** main application is enforcement of policy control and charging in mobile broadband networks. The capabilities of the SASN **428** include traffic inspection for a wide range of protocols, policy enforcement, advanced traffic management, content filtering and insertion, collection of statistics, support for real time charging and support for post-paid and pre-paid users.

The ENIQ (Ericsson Network Intelligence Quotient) **432** is a data mining and reporting system for networks that may be used to obtain usage information, reporting information, and post analysis information. The ENIQ **432** collects statistics from network elements, loads them into a database and provides reports on network quality based on KPIs (Key Performance Indicators). This information may be provided to the derived profile **406**.

The data analytics **432** provides intelligent extraction information to the derived profile **406**. Data analytics **432** enable data analysis for usage and charging within the wireless network. TrueCall **434** provides a PCMD (Per Call Mobile Data) analyzer. TrueCall provides real-time network performance data specific to particular locations (Lat, Long) within the wireless network. The WNG (Wireless Network Guardian) **436** provides traffic analysis over the network. Prospect **438** comprises a performance and service management system that may provide performance management and post analysis information to the derived profile **406**. Prospect **438** is a client service architecture application that delivers performance metrics and makes it simple to generate performance reports for use across the enterprise. A data warehouse **440** stores various types of information with respect to the network that may be utilized by the derived profile **406**. The data warehouse **440** stores information such as billing information that is relevant to the implementation of various applications by the adaptive personal profile.

The personalization engine **402** utilizes the adaptive neural net/fuzzy logic algorithm for generating the adaptive user profile from the derived profile information **406**, the system user profile **408**, the user input profile information **410** and the relevant data from external data sources **312**. Each of these pieces of information enable the creation of an adaptive user profile for controlling applications on an application layer of the mobile device **400** to create a personalized user interface for the user of the wireless mobile device **400**.

Thus, the personalization engine **402** enables a network provider to tap into data collected from eNBs, CPGs, MME, OSS, SASN, ENIQ, data warehouses as well as external solutions like TrueCall to identify the location of the subscriber, their usage patterns and various applications which they may use. Additionally, the personalization engine enables the network to determine the times that they use their applications and other types of information that are specific to the individual end user. This information is utilized to create a unique adaptive user profile that is specific to that user and will provide a great deal of benefits when applied to the mobile device of that user such that their applications are

being generated in a unique fashion considered to present information and relevancy to the user in which they would be most interested.

The created profiles may be provided from the personalization engine **402** as a for pay service. Thus, a service provider may charge a user for use of the profile to create a revenue stream for the network service provider.

Referring now to FIG. 5, there is illustrated the manner in which the personalization engine **302** generates the user profile **502** and adaptive user profile **504** in accordance with the provided data as described in FIG. 4. The user profile **502** receives user specific data **506** and system data **508** from the variety of sources discussed hereinabove. The user specific data **506** comprises data that is particular to the user associated with the user profile **502**. This includes information such as calling habits, interests, present location, etc. The system data **508** comprises general information that may possibly affect the user of the mobile device in some manner. This could include information such as present call traffic, various types of connection information, weather data, traffic data or any other type of general or system-type information that may affect the user and be of benefit to determining control of their application profile.

After the user profile **502** is created, the profile is monitored to determine when either the user-specific data **506** or system data **508** has updated data **510** for insertion into the profile. When updated data **510** is located, the profile **502** is updated at **504** to reflect the information provided by the updated data **510** and returns to monitor for updated data **510**. The adaptive profile **504** and/or user profile **502** are used for controlling the user interface **512** of the wireless mobile device. In this manner, the user interface is adaptively controlled via the adaptive user profile **504** in order to present information to the user that is uniquely associated with or of interest to the user.

Referring now to FIG. 6, there is illustrated a flow diagram describing the process by which the adaptive user profile may be created to control an interface of a wireless mobile device. Data is initially collected from various internal and external data sources at step **602**. As described previously, this data may relate to user-specific information associated with the user of the mobile device or may comprise general information relating to the connection associated with the mobile device or local options and information that may affect the user of the mobile device. The collected data is provided to the personalization engine **302** such that the adaptive neural net/fuzzy logic network may process the data in order to create the personalized profile at step **604**.

The adaptive neural net/fuzzy logic network **404** processes at step **606** the provided data to generate the personalized profile. This personalized profile is provided at step **608** from the network to an associated mobile device. The provided profile is applied to the mobile device at step **610** such that a personalized interface is provided to a user through the mobile device responsive to the generated adaptive user interface created by the personalization engine **302**. Inquiry step **612** determines if any information has been provided to the personalization engine to update the user profile and if not, continues to monitor for updated data at inquiry step **612**. If newly updated data is detected by inquiry step **612**, the updated data is collected at step **614** and provided to the personalization engine at step **604** to adaptively update the adaptive user profile being generated by the personalization engine **302**.

Referring now to FIG. 7, there is illustrated the process for utilizing the adaptive user interface provided to a mobile device. When a mobile device is initialized at step **702**, it will

access its existing user profile at step 704 that is already stored locally within the mobile device. Using the presently existing user profile at step 706, the mobile device begins to initialize applications responsive to the presently stored profile within the mobile device. Inquiry step 708 monitors for changes within the existing profile and when no changes are detected will continue to monitor for received profile changes. Once a profile change is detected by inquiry step 708, the new profile is accessed at step 710 and new applications that may be initialized responsive to the new profile are initiated at step 712. Control passes back to step 708 where the mobile device will continue to monitor for additional profile changes that may cause changes within the presented applications.

It will be appreciated by those skilled in the art having the benefit of this disclosure that this system for application personalization for a mobile device provides an improved interface particularly formatted to the needs of a particular user. It should be understood that the drawings and detailed description herein are to be regarded in an illustrative rather than a restrictive manner, and are not intended to be limiting to the particular forms and examples disclosed. On the contrary, included are any further modifications, changes, rearrangements, substitutions, alternatives, design choices, and embodiments apparent to those of ordinary skill in the art, without departing from the spirit and scope hereof, as defined by the following claims. Thus, it is intended that the following claims be interpreted to embrace all such further modifications, changes, rearrangements, substitutions, alternatives, design choices, and embodiments.

What is claimed is:

1. A system for controlling icons for launching applications displayed within a user interface of a wireless mobile device, comprising:

a network computer server for receiving data related to an adaptive user profile that controls launching of applications implemented on an application layer of the wireless mobile device that have an icon displayed in the user interface of the wireless mobile device and that presents at least a portion of the received data in the launched applications within the user interface of the wireless mobile device located remotely from the network computer server, wherein the adaptive user profile controls which of the applications implemented on the application layer of the wireless mobile device that have the icon displayed in the user interface of the wireless mobile device are launched within the user interface of the wireless mobile device and presents the portion of the received data in the launched applications in the user interface in real time responsive to the received data;

an adaptive neural net/fuzzy logic control application implemented within the network computer server for generating the adaptive user profile controlling the launching of applications implemented on the application layer of the wireless mobile device that have the icon displayed in the user interface of the wireless mobile device and the presentation of at least a portion of the received data in the launched applications within the user interface of the remotely located mobile device responsive to the received data, wherein the received data comprises derived profile data, the derived profile data extracted from a plurality of sources that analyze operations of the wireless mobile device with respect to the wireless network, the plurality of sources comprising a SASN (support aware service node), an ENIQ (Ericsson Network Intelligence Quotient) system, a data analytics node, a per call mobile data analyzer, a WNG

(Wireless Network Guardian), a client service architecture application, and a data warehouse; and wherein the network computer server forwards the adaptive user profile to the wireless mobile device and forwards updated adaptive user profiles as the updated adaptive user profiles become available.

2. The system of claim 1, wherein the received data comprises user profile data provided from a wireless network provider specific to the wireless device user.

3. The system of claim 1, wherein the received data further comprises input user data that has been entered by the user.

4. The system of claim 3 further including a secure user database on a cloud for storing the input user data provided by a user.

5. The system of claim 1, wherein the received data comprises external data from non-wireless network system related sources.

6. The system of claim 1, wherein the adaptive neural net/fuzzy logic control application generates a plurality of adaptive user profiles each of the plurality of adaptive user profiles uniquely associated with a particular wireless mobile device.

7. The system of claim 1, wherein the adaptive user profile is provided to a user of the wireless mobile device from a network side as a pay service.

8. The system of claim 1, wherein control of the network server and the adaptive neural net/fuzzy logic control application are controlled within a personalization control layer implemented between an application control layer and a presentation control layer.

9. A system for controlling icons for launching applications displayed within a user interface of a wireless mobile device, comprising:

a network computer server for receiving data related to an adaptive user profile that controls launching of non-advertising related applications implemented on an application layer of the wireless mobile device that have an icon displayed in the user interface of the wireless mobile device and controls presentation of at least a portion of the received data in the launched non-advertising related applications implemented on an application layer of the wireless mobile device that have the icon displayed in the user interface of the wireless mobile device within the user interface of the wireless mobile device located remotely from the network computer server, wherein the adaptive user profile controls which of the non-advertising related applications implemented on the application layer of the wireless mobile device that have the icon displayed in the user interface of the wireless mobile device launched within the user interface of the wireless mobile device and presents the portion of the received data in the launched non-advertising related applications implemented on an application layer of the wireless mobile device that have the icon displayed in the user interface of the wireless mobile device in the user interface in real time responsive to the received data, the received data comprising user profile data provided from a wireless network provider specific to the wireless device user, derived profile data extracted from a plurality of sources that analyze operations of the wireless mobile device with respect to the wireless network and input user data that has been entered by the user, the plurality of sources comprising a SASN (support aware service node), an ENIQ (Ericsson Network Intelligence Quotient) system, a data analytics node, a per call mobile data analyzer, a WNG (Wireless

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Network Guardian), a client service architecture application, and a data warehouse;  
 an adaptive neural net/fuzzy logic control application implemented within the network computer server for generating the adaptive user profile controlling the launching of the non-advertising related applications implemented on the application layer of the wireless mobile device that have the icon displayed in the user interface of the wireless mobile device and controls presentation of at least a portion of the received data in the launched non-advertising related applications implemented on the application layer of the wireless mobile device that have the icon displayed in the user interface of the remotely located mobile device responsive to the received data; and  
 wherein the network computer server forwards the adaptive user profile to the wireless mobile device and forwards updated adaptive user profiles as the updated adaptive user profiles become available.

10. The system of claim 9 further including a secure user database for storing the input user data provided by a user.

11. The system of claim 9, wherein the received data comprises external data from non-wireless network system related sources.

12. The system of claim 9, wherein the adaptive user profile is provided to a user of the wireless mobile device from a network side as a pay service.

13. The system of claim 9, wherein control of the network server and the adaptive neural net/fuzzy logic control application are controlled within a personalization control layer implemented between an application control layer and a presentation control layer.

14. A method for controlling icons for launching of applications displayed within a user interface of a wireless mobile device, comprising:

receiving data related to an adaptive user profile at a network computer server, the received data comprising derived profile data extracted from a plurality of sources that analyze operations of the wireless mobile device with respect to the wireless network, the plurality of sources comprising a SASN (support aware service node), an ENIQ (Ericsson Network Intelligence Quotient) system, a data analytics node, a per call mobile data analyzer, a WNG (Wireless Network Guardian), a client service architecture application, and a data warehouse;

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generating the adaptive user profile responsive to the received data at a network server, the adaptive user profile controlling launching of applications implemented on an application layer of the wireless mobile device that have an icon displayed in the user interface of the wireless mobile device and controlling presentation of at least a portion of the received data in the launched applications within a user interface of a remotely located wireless mobile device;

changing the adaptive user profile in real time responsive to the received data at a network server to create an updated adaptive user profile;

transmitting the updated adaptive user profile to the remotely located wireless mobile device as the updated adaptive user profile becomes available; and

controlling the launching of applications implemented on the application layer of the wireless mobile device that have the icon displayed in the user interface of the wireless mobile device and presentation of at least a portion of the received data in the launched applications within the user interface of the remotely located wireless mobile device responsive to the adaptive user profile.

15. The method of claim 14, wherein the step of generating further comprises the step of generating the adaptive user profile responsive to user profile data provided from a wireless network provider specific to the wireless device user.

16. The method of claim 14, wherein the step of generating further comprises the step of generating the adaptive user profile responsive to derived profile data extracted from a plurality of sources that analyze operations of the mobile device with respect to the wireless network.

17. The method of claim 14, wherein the step of generating further comprises the step of generating the adaptive user profile responsive to input user data that has been entered by the user.

18. The method of claim 14, wherein the step of generating further comprises the step of generating the adaptive user profile responsive to external data from non-wireless network system related sources.

19. The method of claim 14, wherein the step of controlling further comprises the step of updating the adaptive user profile in real time responsive to the received data.

20. The method of claim 14 further comprising the step of providing the adaptive user profile to a user of the wireless mobile device from a network side as a pay service.

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